CHAPTER 7—EVALUATION OF ALTERNATIVES

This chapter draws upon and summarizes the information provided in previous chapters, and organizes that information to highlight significant trade-offs to be made in selecting a locally preferred alternative. Section 7.1 summarizes the evaluation methodology. It is followed by the evaluation of the TSM and Build Alternatives in Section 7.2, the Station and Alignment Options in Section 7.3, the Vehicle Storage and Maintenance Facility options in Section 7.4, and the project phasing options in Section 7.5. Further details on the evaluation methodology and results can be found in the *Westside Subway Extension Comparative Benefits and Costs Analysis Technical Report*.

7.1 Evaluation Methodology

This section describes the approach taken to evaluate the alternatives presented in Chapter 2, Alternatives Considered. The methodology includes a set of goals, objectives, and evaluation measures for comparing the alternatives in terms of their overall effectiveness in meeting the purpose and need, their costs and feasibility, and their impacts.

7.1.1 Goals, Objectives, and Evaluation Measures

Seven goals were established in the Alternatives Analysis (AA) phase of planning and were used to both screen out alternatives and identify those alternatives to be carried forward into the Draft EIS/EIR.

- **Goal A: Mobility Improvement**—The primary purpose of the project is to improve public transit service and mobility in the Westside Extension Transit Corridor. To compare the alternatives in terms of mobility improvement, the evaluation examines how well each alternative improves the ability of residents and employees to reach desired destinations through the provision of high quality, convenient, and reliable east-west transit service.
- **Goal B: Transit Supportive Land Use Policies and Conditions**—A major aspect of this goal is to locate transit alignments and stations in areas with existing land uses conducive to transit use or in those areas that have the greatest potential to develop transit supportive land uses.
- **Goal C: Cost-Effectiveness**—This goal ensures that both the capital and operating costs of the project are commensurate with its benefits.
- **Goal D: Project Feasibility**—The fourth goal is that the project be financially feasible. Specifically, this goal helps ensure that funds for the construction and operation will be readily available and will not place undue burdens on the sources of those funds. The goal also includes minimizing risks associated with project construction.
- **Goal E: Equity**—This goal evaluates project solutions based on how fairly the costs and benefits are distributed across different population groups with particular emphasis on serving transit-dependent communities.
- **Goal F: Environmental Considerations**—The sixth goal is to develop solutions which minimize impacts to environmental resources and communities within the study area.

- **Goal G: Public Acceptance**—This goal aims to develop solutions that are supported by the public with special emphasis on residents and businesses within the study area.

In the 2009 AA, specific objectives and measures were developed and applied to assess the extent to which each alternative met each goal. The objectives and measures used in this Draft EIS/EIR draw upon and refine those used in 2009, reflecting current data and the more focused evaluation in the Draft EIS/EIR.

These goals, objectives, and measures also capture, to a degree, the New Starts Criteria that the Federal Transit Administration (FTA) currently uses to rate projects for funding in the discretionary Section 5309 New Starts program. The FTA's rating system considers projects from two perspectives—project justification and local financial commitment—and considers the following criteria to arrive at a project rating:

- Project Justification Criteria
  - Mobility Improvements (20% of justification rating)
  - Cost Effectiveness (20% of justification rating)
  - Transit-Supportive Land Use (20% of justification rating)
  - Economic Development Benefits (20% of justification rating)
  - Environmental Benefits(10% of justification rating)
  - Operating Efficiencies(10% of justification rating)
- Financial Commitment Criteria
  - Non-New Starts Share of Capital Cost (20% of financial Rating)
  - Soundness of Capital Finance Plan (50% of financial rating)
  - Soundness of Operating Finance Plan (30% of financial rating)

To be recommended for funding by FTA, projects must receive at least a *medium* rating on both project justification and local financial commitment. It should be noted that FTA has started a rulemaking process that may significantly alter the measures FTA uses to evaluate, rate, and select projects for funding recommendations.

7.1.2 Decision Tree Framework

Recognizing the complexity of the Westside corridor and the large number of alternatives and options remaining, the evaluation is structured around a *decision tree* framework. It first presents the TSM and the five Build alternatives to support decisions on the transit mode and project concept. Then, the evaluation looks more closely at station location and alignment options that might be selected to refine any of the Build alternatives.

7.2 TSM and Build Alternatives

This section compares the TSM Alternative and the five Build alternatives with the No Build and with each other, providing the basis for decisions on the preferred mode and overall project concept. Data presented in this section assume that the Build alternatives would have all of the stations and follow the base alignment as presented in Chapter 2. Other station location and alignment options are evaluated in Section 7.3.

For this comparison, Alternatives 1, 2, and 3 are considered to be Wilshire HRT alternatives, and Alternatives 4 and 5 are Combined HRT (Wilshire Plus West Hollywood) Alternatives. Data for comparing the options are presented in Table 7-1, and significant findings are highlighted below.

Table 7-1. Evaluation Results for TSM and Build Alternatives

Relevant Goals, Objectives, Criteria	No Build	TSM	Wilshire HRT			Combined HRT (Wilshire Plus West Hollywood)	
			Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Mobility Improvement							
Average peak period travel time between select origin-destination pairs and rating	70.0 Low	69.6 Low	49.6 Medium	49.6 Medium	46.6 Medium-High	44.7 Medium-High	41.6 High
Average end-to-end transit operating speeds and rating	13.5 Low	13.5 Low	31.1 High	30.8 High	31.8 High	32.0 High	33.0 High
Competitiveness with auto speed	Low	Low	Low-Medium	Medium	Medium-High	High	High
Percentage of transit passenger miles on fixed guideway	4.7% Low	4.6% Low	39.2% Medium-High	42.0% Medium-High	51.6% High	44.0% Medium-High	53.0% High
Number of transfers between select origin-destination pairs	Low	Low	Medium-High	Medium-High	High	Medium-High	High
New transit trips (per day in 2035)	Base	2,115	24,142 Medium	27,615 Medium	35,235 Medium-High	31,224 Medium-High	40,123 High
Transit Supportive Land Use Policies and Conditions							
High-density mixed use activity centers within 1/2 mile of alignment	NA	NA	6	7	8	10	12
High-opportunity areas for redevelopment within 1/2 mile of alignment	NA	NA	1	1	1	2	2
Cost Effectiveness							
Capital cost in million 2009 dollars	Base	$42	$4,036	$4,358	$6,116	$6,985	$8,747
Year 2035 O&M cost in million 2009 dollars	$1,742	$1,746	$1,778	$1,782	$1,804	$1,831	$1,861
Cost per hour of user benefit compared with TSM Alternative (FTA Cost Effectiveness Index, or CEI)	NA	Base	$35.98	$33.58	$36.31	$49.50	$47.55
Project Feasibility							
Affordability within limits of Metro's Long-Range Transportation Plan	Yes	Yes	Yes	Yes	No	No	No
Equity							
Low income residents within 1/2 mile of guideway alignment	NA	NA	25,707	27,180	32,114	38,799	43,733
% of residents who are low income	NA	NA	17.3%	17.1%	15.6%	16.4%	15.4%
Minority residents within 1/2 mile of guideway alignment	NA	NA	71,939	74,236	83,491	93,688	102,943
% of residents who are minority	NA	NA	47.0%	45.5%	39.5%	38.9%	35.6%
Environmental Considerations							
Number of single-family residences displaced	0	0	1	1	1	1	1
Number of multi-family residences displaced	0	0	1 (32 units)	1 (32 units)	1 (32 units)	1 (32 units)	1 (32 units)
Number of jobs potentially displaced	0	0	302	302	413	363	474
Daily reduction in vehicle miles traveled compared to No Build Alternative	Base	0	28,982	31,899	37,768	34,786	41,643

Source: Westside Subway Extension Comparative Benefits and Costs Analysis Technical Report (Metro 2010w)

7.2.1 Mobility Improvements

To assess how well the TSM and Build alternatives improve mobility, four objectives are considered:

- Reduce transit travel time
- Improve trip reliability, comfort, and convenience
- Provide sufficient transit capacity to meet 2035 transit demand and beyond (expandability)
- Maximize potential transit ridership

Table 7-1 shows each alternative's rating on each of these five mobility objectives. The ratings range from high to low, with a high rating being assigned to those alternatives that provide the greatest mobility improvement and low to those that provide the least.

Transit Travel Time

The Build Alternatives, operating in an exclusive guideway that is fully separated from roadway traffic, would achieve much higher speeds than would be possible with buses, even with the priority treatments assumed in the No Build and TSM Alternatives. Thus, all five of the Build Alternatives would have faster travel times than the No Build and TSM Alternatives. The longer Alternatives—Alternatives 3 and 5 in particular—provide faster travel to and from Santa Monica. For trips to and from the San Fernando Valley, Alternatives 4 and 5 would be 7 to 10 minutes faster than Alternatives 1, 2 and 3, reflecting the additional linkage to the Metro Red Line in Hollywood. New links between the Build Alternatives and other transit lines would improve transit travel time for residents throughout the County.

Because of its higher operating speeds, the rail alternatives offer a travel mode that is more competitive with the automobile. During peak periods, rail operating speeds are faster than speeds for a comparable auto trip. Competitiveness is greatest for the alternatives with the greatest mileage of rail, as the difference in speed becomes more apparent to potential riders for trips covering longer distances and reaching the more densely developed parts of the study area. By providing a direct connection from Century City and Westwood to West Hollywood, Hollywood and North Hollywood in the San Fernando Valley, Alternatives 4 and 5 have the greatest potential to shorten transit travel time and, thus, would be most competitive with the auto.

Reliability, Comfort, and Convenience

Transit vehicles in mixed flow traffic not only operate more slowly, but also have less reliable travel time, as buses can be affected by traffic incidents or adverse conditions. The bunching of buses can lead to irregular headways and uncertain trip times. In the Build Alternatives, transit would operate on its own exclusive guideway and would not be affected by roadway conditions. Arrival times and trip times would be extremely reliable.

The alternatives can be compared in terms of the percentage of transit passenger miles that would occur on an exclusive fixed guideway facility. The percentage grows significantly with all of the Build Alternatives and exceeds 50 percent with Alternatives 3 and 5. The remaining transit passenger miles would be in buses operating in mixed

traffic or bus lanes subject to various traffic delays. Under the Build Alternatives, subway service would provide frequent and reliable service no matter the traffic conditions on Study Area streets and highways.

Another measure of transit travel time and convenience to passengers is the number of transfers travelers must make to get from their origin to their destination. Riders generally consider out-of-vehicle travel time—i.e., the time spent waiting for a bus or train to arrive—as being more onerous than time spent moving in a vehicle. All of the rail alternatives would lead to a significant reduction in the number of transfers. Among the Build Alternatives, Alternatives 3 and 5 (which would extend rail to Santa Monica) tend to require the fewest transfers, and are rated high in Table 7-1. The alternatives terminating at Westwood are rated medium-high, because those transit riders traveling between Santa Monica and places east of Westwood would need to transfer between rail and bus. The No Build and TSM alternatives would result in substantially more transfers.

Alternative 5 provides the largest number of direct connections to other rail lines and to north-south bus routes, followed by Alternatives 3 and 4. Under each of the alternatives, riders from the study area can access Metrolink and Amtrak with just one transfer at Union Station.

For transit riders who stand, subway service would provide increased comfort and safety compared to frequent stop-and-go travel that occurs on buses operating in mixed traffic or uneven road surfaces. Because station platforms will be at the same level as subway vehicles, they will accommodate quick and easy boardings for all passengers.

Capacity and Expandability

While the TSM and Build alternatives offer sufficient capacity to meet the transit demand projected for 2035, the Build Alternatives offer greater ability to expand capacity as growth continues beyond 2035.

Transit Ridership

Alternatives that attract the highest ridership are those that offer the best service to the greatest number of people. Projected increases in transit ridership also indicate the extent to which an alternative can be expected to reduce vehicle miles of travel and congestion on the highway system, reduce air pollutant emissions, and reduce the use of gasoline.

As shown in Table 7-1, Alternative 5 would lead to the largest increase in transit ridership, as measured by new transit trips. By covering the largest service area, as well as offering a connection in Hollywood between the Metro Red and Purple Lines, Alternative 5 offers the greatest improvement in transit service. Alternative 3 has the second highest increase in transit ridership. Several findings are of particular note:

- A comparison between Alternatives 5 and 3 and between Alternatives 4 and 2 shows the benefits of the West Hollywood connection. The connection would result in about 3,600 to 4,900 new daily transit trips per day, an increase of about 13 percent.

- The one-station extension from Westwood/UCLA (Alternative 1) to the Westwood/VA Hospital (Alternative 2) results in 3,500 new transit trips, an increase of close to 15 percent.
- The benefits of extending the line from Westwood to Santa Monica are shown by comparing Alternatives 3 and 2 and Alternatives 5 and 4. The Santa Monica extension would increase the number of new daily transit trips by 7,500 to 8,900, or about 28 percent.
- The TSM Alternative is least effective, attracting no more than 5 to 10 percent of the new riders attracted by the rail alternatives.

7.2.2 Transit Supportive Land Use Policies and Conditions

The *City of Los Angeles Land Use/Transportation Policy* (Metro 1993), adopted in November 1993, is a joint effort of Metro and the City to coordinate land use and transportation. The Policy seeks to establish transit centers and station areas as focal points for future growth and to foster higher-density, mixed-use projects near rail and major bus facilities. West Hollywood, Beverly Hills, and Santa Monica also have adopted plans that encourage transit-oriented development.

The extent to which each of the Build alternatives meets these land use goals can be measured by the number of high-density, mixed-use activity centers within one-half mile of the alignment and by the number of high opportunity areas for redevelopment within one-half mile of the alignment. Twelve activity centers—defined as locations with major commercial activity and mixed uses—and two high opportunity areas are identified for this comparison (Figure 7-1).

All of the alternatives were developed to serve these activity centers and high opportunity areas. The extent to which they are served is a function of each alternative's length and number of stations. Alternatives 4 and 5, thus, serve more activity centers and high opportunity areas than the other alternatives.

Transit supportive land use is also a critical aspect of the FTA's rating of projects that are seeking discretionary New Starts funds. Forty percent of the project justification rating is a function of transit-oriented land use.

7.2.3 Cost-Effectiveness

Whereas Sections 7.2.1 and 7.2.2 compared the alternatives in terms of their effectiveness in meeting mobility and land use goals, this section addresses the cost-effectiveness goal, comparing each alternative's benefits with its capital and operating costs. The Build Alternatives are significantly more expensive than the No Build and TSM Alternatives. In 2009 dollars, the rail alternatives range in cost from $4.0 to $8.7 billion. The rail alternatives are also more costly to operate and maintain.

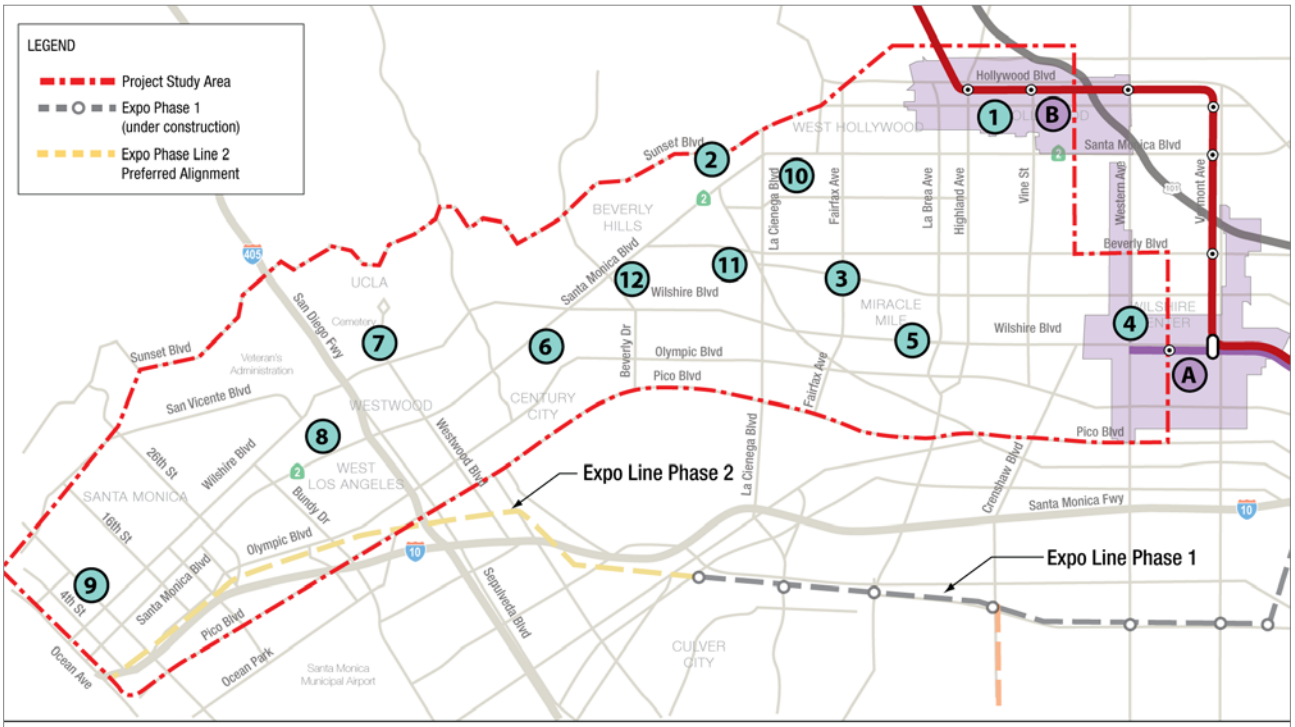
Table 7-1 presents each alternative's cost per hour of user benefits as a measure of cost-effectiveness. With faster speeds, the HRT Alternatives would save transit riders between 31,000 and 52,000 hours of equivalent travel time (transit system user benefits) on an average weekday in 2035. This analysis further reveals that

- Alternatives 1, 2, and 3 are significantly more cost effective than Alternatives 4 and 5. In other words, while Alternatives 4 and 5 tend to have more benefits than

Alternatives 1, 2, and 3, they achieve these additional benefits at a higher incremental cost.

- The cost effectiveness indices (CEI) for Alternatives 1 and 3 are similar. The added investment of extending the line to Santa Monica has roughly the same cost per hour of benefit as a shorter extension to Westwood/UCLA.
- Alternative 2 is the most cost effective Build alternative.

The CEIs shown here will be refined by further modeling and cost estimating and will ultimately be confirmed by FTA's review and acceptance. The CEI results provided here are further discussed in Sections 7.3 and 7.4, which explain how the project's CEI might change based on certain station, alignment, and yard and shop decisions. There are likely to be further opportunities to refine the ridership forecasts and transit system user benefits forecasts as the locally preferred alternative is advanced.



Activity Centers

1. Hollywood
2. Sunset Strip
3. The Grove/Farmer's Market
4. Wilshire Center
5. Miracle Mile
6. Century City
7. Westwood/UCLA
8. West Los Angeles
9. Downtown Santa Monica
10. West Hollywood
11. Beverly Center/Cedars Sinai
12. Beverly Hills/Rodeo Drive

High Opportunity Areas

A. City of Los Angeles Community Redevelopment Agency (CRA) Redevelopment Area in Wilshire Center/Koreatown

B. City of Los Angeles CRA Redevelopment Area in Hollywood

Figure 7-1. Activity Centers and High Opportunity Areas within one-half mile of the Alignment

Cost-Effectiveness Index

The cost-effectiveness measure used in this evaluation is derived by annualizing each alternative's capital cost, adding the annual O&M cost, and dividing the sum by the alternative's annual transit system user benefits. User benefits refer primarily to travel time savings.

This measure, referred to as the "cost effectiveness index", is used by the Federal Transit Administration in its rating of projects seeking New Starts funds.

FTA currently assigns "low" cost effectiveness ratings to projects with CEIs exceeding $31.50, and "medium-low" ratings to those with CEIs between $25.00 and $31.49 (Figure 7-2). With such a rating, under current rules and guidelines, FTA would only recommend New Starts funding if the project performs very well on FTA's other project justification criteria, such as transit supportive land use and economic development. Of note, FTA has recently undertaken a rulemaking process that will reconsider how cost effectiveness is measured. Future Federal legislation to reauthorize the FTA program may also address the criteria that FTA uses to evaluate and rate New Starts projects.

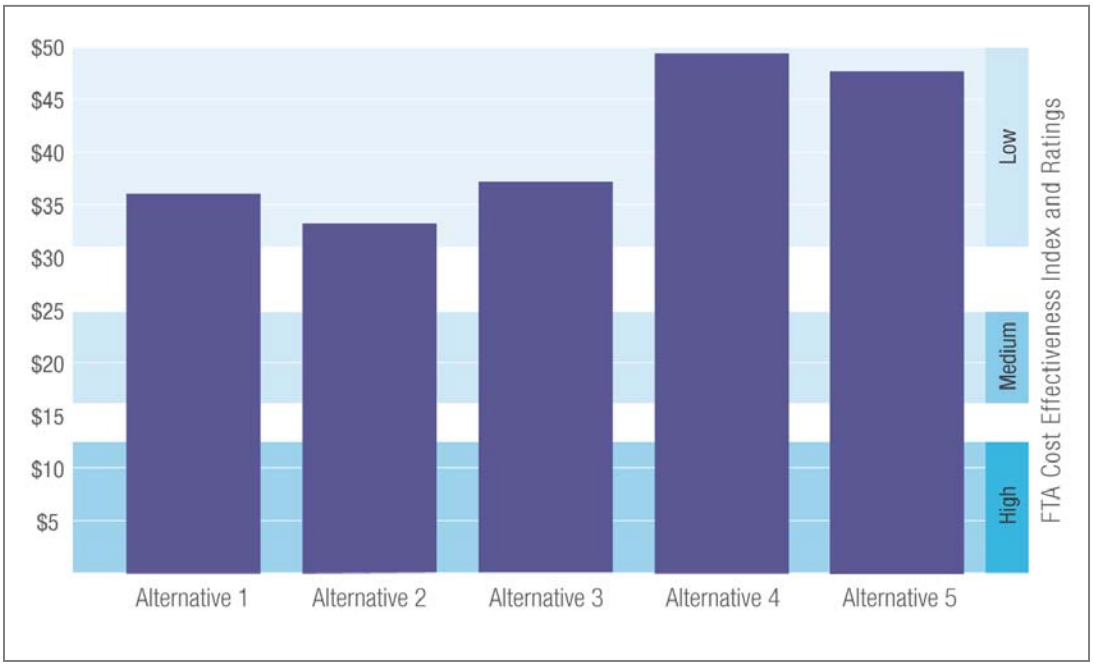


Figure 7-2. Cost-Effectiveness Indices

7.2.4 Project Feasibility

The Westside Subway Extension depends upon funding from the Measure R sales tax and Federal New Starts funding. Metro's Measure R Ordinance and its fiscally constrained Long Range Transportation Plan (LRTP) (Metro 2009) set aside $2.7 billion (in 2009 dollars) for a Westside Subway Extension. In addition, the LRTP assumed $1.37 billion (2009 dollars) in New Starts funds. The financial feasibility of each alternative depends upon:

- How well the alternative is likely to compete for New Starts funds, where the ratings process considers both project justification and local financial commitment.
- Whether the alternative's capital cost is affordable within the financial assumptions of Metro's fiscally constrained LRTP.

Considering both land use and cost effectiveness, Alternatives 1 through 3 are most likely to receive at least a medium rating for project justification, making these alternatives eligible for a New Starts funding recommendation. Alternatives 4 and 5 may have a greater challenge given that their CEIs are well above the normal competitive range.

Comparing the capital funding requirements of each alternative with the Measure R funds set aside for the Westside project in the LRTP, and assuming that the project is competitive for New Starts funds, shows that

- The TSM Alternative and Alternatives 1 and 2 are financially feasible.
- Alternatives 3, 4, and 5 are not currently financially feasible. Implementation of Alternative 1 or Alternative 2 would not preclude a future extension to Santa Monica or a future West Hollywood connection. However, additional local funding would need to be identified.

A New Starts funding recommendation also requires that FTA give the project at least a *medium* rating for local financial commitment. The local funds needed to build Alternatives 1 and 2 are guaranteed by Measure R.

7.2.5 Equity

Four measures of equity are used to compare the Build alternatives:

- The number of low income residents within one-half mile of the rail alignment
- The percentage of residents within one-half mile of the alignment who are low income
- The number of minority (Black, Asian, and Hispanic) residents within one-half mile of the alignment
- The percentage of residents within one-half mile of the alignment who are minority.

As shown in Table 7-1, the number of low-income and minority residents living in close proximity to the project increases with the project scope and number of stations. However, the percentage of residents within one-half mile who are low income or minority varies little across the alternatives.

Those alternatives with the larger number of stations will provide better mobility to a larger number of low-income and minority people. Similarly, alternatives with a larger scope and number of stations will expose more low-income and minority residents to short-term construction impacts.

7.2.6 Environmental Considerations

The five Build alternatives are completely in subway. Thus, the potential for environmental impacts occurs mostly at stations, where portals are built on the surface. Vent shafts would also be on the surface. Power substations would be located in the station box or in the crossover box and would be located in a room that is about 50 feet by 100 feet in a below grade structure.

Each of the five Build alternatives would displace one or more properties in order to construct station portals and provide for construction staging. Some business displacement would occur. The total number of jobs displaced would depend on which

portal location is selected at each station. Several hundred jobs have been identified for potential displacement, but only a small percentage would actually be displaced.

The five Build Alternatives would all lead to a reduction in vehicle miles of travel (VMT) on the highway system, with attendant reductions in roadway congestion, pollutant emissions, and fossil fuel consumption. The decrease is small in relation to total VMT in the study area.

Each of the alternatives would also cause impacts during construction. As discussed in Chapter 4, construction impacts would include traffic and access disruptions near station sites, construction noise and emissions (NOx and PM10), temporary removal of parking, visual effects, and haul trucks removing material excavated from the tunnel and station boxes. The amount of impact would generally be a function of the length of the subway and the number of stations. Metro will mitigate these construction impacts as previously described.

7.2.7 Trade-offs

In summary, considering the TSM and Build alternatives in terms of all of the goals:

- All of the Build Alternatives are far more effective than the TSM Alternative in terms of enhancing mobility, serving development opportunities, and addressing other aspects of Purpose and Need. Alternatives 3, 4, and 5 are more effective than Alternatives 1 and 2.
- While offering few mobility benefits, the TSM Alternative is the most cost-effective due to its low cost.
- Alternatives 1, 2, and 3 have similar cost-effectiveness indices and are more cost-effective than Alternatives 4 and 5.
- Alternatives 1 and 2 are expected to be most competitive for New Starts funds and can be built with available Measure R and other identified funds. Alternatives 3, 4, and 5 are not financially feasible without a new source of revenues.
- Alternative 2, which extends the subway beyond Westwood/UCLA to the VA Hospital, adds riders and benefits at a reasonable cost and is financially feasible.
- All of the alternatives would reduce vehicle miles traveled, pollutant emissions, and energy consumption. The longer Build alternatives have the greatest environmental benefit.
- All of the alternatives would displace jobs and have construction impacts, with the longer alternatives having the largest impacts.

7.3 Station and Alignment Options

This section focuses on six parts of the corridor where there are station and alignment options. It addresses those objectives and measures considered to be most relevant to decisions on each of these options.

For example, a person's propensity to use transit is affected by the ease of getting to and from stations at either end of the trip. For several of the station options considered here, pedestrian access differences, such as the need to cross more than one roadway or walk at least a full block to transfer between a subway and bus, are significant. In other cases,

the station and alignment options lead to significant travel time differences on the system, and would cause significant changes in capital cost and impacts.

7.3.1 Option 1: Wilshire/Crenshaw Station

Removal of this station would reduce transit access for those residents and jobs within one-half mile of the proposed Crenshaw Station. The Wilshire/Western Station is over one-half mile away, a significant distance to walk. Residents of the station area and workers with jobs in the station area would be dependent on the bus system for the "last mile" to their homes and jobs. Due to the slower speeds on buses, and the possible need for an additional transfer, they would be less likely to use transit.

Deleting the Crenshaw Station offers the opportunity to reduce project capital costs by $155 million. This cost savings leads to an improved cost-effectiveness index (Table 7-2), even though the number of residents and jobs within walking distance of a station is reduced.

Table 7-2. Impact of Removing Crenshaw Station on Cost Effectiveness Index

	Alt 1	Alt 2	Alt 3
CEI with Crenshaw Station	$35.98	$33.58	$36.31
CEI without Crenshaw Station	$34.40	$31.96	$35.16

Deleting this station would also respond to community concerns about development pressures that could change the character of this residential area.

7.3.2 Option 2: Fairfax Station

Either of the two Fairfax station options offers a station portal serving the Los Angeles County Museum of Art. The east option provides more direct access but has somewhat greater potential to encounter paleontological remains and gassy soils and may cause more traffic impacts during construction. Both locations would have the same cost.

7.3.3 Option 3: La Cienega Station

The west station option creates the opportunity for direct transfers between the Wilshire subway line and the West Hollywood line in Alternatives 4 and 5. With the east station, transfers would be possible at the Wilshire/Rodeo Station, but would require out-of-direction travel and added travel time. The east station site offers better access to residences and jobs east of La Cienega. Moving the Wilshire/La Cienega Station to the west would save $18.9 million.

7.3.4 Option 4: Century City Station and Alignment Options

In this portion of the project, there are both station location options and alignment options. Decisions on the best location for a Century City station can be made first, based upon various factors discussed below. Once a station location is selected, alignment options connecting that station location with adjacent stations can be evaluated. Accordingly, this section begins by highlighting the differences between the two location options for a Century City station.

For the Century City Station, the feasibility of the Santa Monica Boulevard site assumed in the Base alignment for the five Build alternatives is compromised by its close proximity to the Santa Monica fault. The optional Constellation site is farther from the fault and would have a lower seismic risk. The Constellation site is also more centrally located within Century City, enhancing walk access for many passengers boarding and alighting at Century City.

Relocating the station from Santa Monica Boulevard to Constellation saves $4.1 million in station costs. Because it increases the length of the alignment, however, a station at Constellation would increase the overall capital cost by $60.4 million.

If the Century City station is located at Constellation, there are two alignment options for connecting to the Wilshire/Rodeo station, the Constellation North option and the Constellation South option. If the Century City station is located on Santa Monica Boulevard, the alignment between Century City and Wilshire/Rodeo would follow Wilshire and Santa Monica Boulevards. As indicated in Table 7-3, neither the alignment options nor the station location options would have a significant impact on transit travel time between Century City and the Wilshire/Rodeo station.

Table 7-3. Transit Travel Time for Alignment Options between Wilshire/Rodeo and Century City

Relevant Goals, Objectives, Criteria	Constellation South Alignment to Constellation Station	Constellation North Alignment to Constellation Station	Santa Monica Boulevard Alignment to Santa Monica Boulevard Station (Base)
Mobility Improvement			
Peak period travel time (in minutes, this segment)	1.82	1.82	1.89

Regardless of the site selected for the Century City station, there are three alignment options for connecting the station to the Westwood/UCLA station – the East (Base), Central, and West alignments – and two possible station sites for the Westwood/UCLA station – On Street and Off-Street – as further assessed in Section 7.3.5. Table 7-4 and Table 7-5 compare the alignment options between Century City and Westwood/UCLA in terms of their impact on cost and travel time. Table 7-4 assumes a Century City station on Santa Monica Boulevard, while Table 7-5 assumes a Century City station on Constellation.

The West alignment is longer than the other two, and would increase travel time between Century City and Westwood by more than two minutes. This, in turn, would lead to somewhat lower ridership and user benefits, and to fewer air quality and energy conservation benefits.

The West alignment option would also increase capital cost by more than $140 million compared with the Base, and increase operating and maintenance costs. Those alignment options with higher costs will also have higher CEIs and would be less competitive for FTA New Starts funds.

Table 7-4. Evaluation of Alignment Options between Century City (Santa Monica Boulevard Station) and Westwood/UCLA

Relevant Goals, Objectives, Criteria	East Alignment to Westwood/UCLA Off-Street Station (Base)	East Alignment to Westwood/UCLA On-Street Station	Central Alignment to UCLA Off-Street Station	Central Alignment to UCLA On-Street Station	West Alignment to UCLA Off-Street Station	West Alignment to UCLA On-Street Station
Mobility Improvement						
Peak period travel time (in minutes, this segment)	2.34	2.34	2.34	2.34	4.9	4.9
Cost-Effectiveness						
Capital cost in million 2009 dollars	Base	$9M less than Base	$6M more than Base	$3M more than Base	$135M more than Base	$122 M more than Base
Environmental Considerations						
Number of Subsurface Easements (Residential)	200	176	346	250	130	126
Number of Subsurface Easements (Commercial & Other)	12	5	12	8	22	17

Table 7-5. Evaluation of Alignment Options between Century City (Constellation Station) and Westwood/UCLA

Relevant Goals, Objectives, Criteria	East Alignment to Westwood/UCLA Off-Street Station	East Alignment to Westwood/UCLA Off-Street Station	Central Alignment to UCLA Off-Street Station	Central Alignment to UCLA On-Street Station	West Alignment to UCLA Off-Street Station	West Alignment to UCLA On-Street Station
Mobility Improvement						
Peak period travel time (in minutes, this segment)	2.49	2.49	2.49	2.49	4.9	4.9
Cost-Effectiveness						
Capital cost in million 2009 dollars	$23.5M more than Base	$24.8M more than Base	$32.2M more than Base	$35.7M more than Base	$138.5M more than Base	$142.5M more than Base
Environmental Considerations						
Number of Subsurface Easements (Residential)	222	198	441	345	206	202
Number of Subsurface Easements (Commercial & Other)	14	13	10	6	23	18

7.3.5 Option 5: Westwood/UCLA Station Option

The on-street option under Wilshire Boulevard increases capital costs by $10.1 million and would disrupt roadway traffic during the construction period. The off-street site could temporarily displace parking.

7.3.6 Option 6: Westwood/VA Hospital

The south station site is situated less than 300 feet from the hospital, while the north option is more than 1,000 feet away on the other side of Wilshire. Thus, the south option offers much better pedestrian access to the VA Hospital for employees, patients, and visitors.

Moving the station to the north side of Wilshire Boulevard would increase project cost by $92.6 million, but would avoid construction impacts near the VA Hospital, and help overcome security concerns related to locating the tunnel near the Federal Building. However, a station on the north side would have a greater potential to adversely affect cultural resources.

7.4 Vehicle Storage and Maintenance Facility

The Division 20 Maintenance and Storage Facility cannot accommodate Metro's fleet requirements for any of the five Build Alternatives. Two options for providing this expanded capacity are:

- Additional storage immediately south of the Division 20 Maintenance and Storage Facility between the 4th and 6th Street Bridges, which would accommodate Metro's requirements for Alternatives 1 and 2.
- Satellite facility at the Union Pacific Los Angeles Transportation Center Rail Yard that is connected by yard lead tracks to the Division 20 Maintenance and Storage Facility, which would accommodate Metro's requirements for all five HRT Alternatives.

Cost effectiveness and environment are the most relevant goals to this decision. Adding storage south of the Division 20 facility is estimated to cost $34 million, while the satellite facility is estimated to cost $124 million. The capital cost estimates presented in Tables 7-1 and 7-2 include the Division 20 facility cost for Alternatives 1 and 2, and include the satellite facility costs for Alternatives 3, 4, and 5. If Metro selects Alternative 1 or 2 with the satellite facility, to provide storage capacity for further expansion, the cost of those alternatives would increase and cost effectiveness would be reduced.

Use of the UP Los Angeles Transportation Center Rail Yard site would require a new bridge crossing the Los Angeles River, adding to the capital cost and potentially requiring permits and approvals by others. An existing historic bridge would be affected, triggering Section 106 and 4(f) requirements. Railroad approval would be required, and railroad land would need to be acquired.

7.5 Project Phasing

The final decision to be made in selecting a Locally Preferred Alternative is the best terminus for an initial phase of implementation, in the event that the project must be built in phases over time. Two Minimum Operable Segment (MOS) options are evaluated in this section:

- MOS 1—Interim terminus at Fairfax
- MOS 2—Interim terminus at Century City

These are compared with the five Build Alternatives evaluated Section 7.1, as well as the No Build and TSM Alternatives. Two goals are considered to be most relevant to a decision on phasing—cost effectiveness and equity. Station area impacts at the interim termini (Fairfax for MOS-1, Century City for MOS-2) would not differ significantly from the impacts noted previously.

7.5.1 Cost-Effectiveness

In the short term, as shown in Table 7-6, the two MOSs are less costly to build than the longer rail alternatives. However, the MOSs simply delay the investment required to complete the Westside Subway Extension. By phasing the construction, the total cost to complete the ultimate project may increase, in year of expenditure dollars, as the cost of materials and labor may escalate over time.

The MOSs are less cost-effective than the full length alternatives evaluated in Section 7.1. MOS 1 has a projected CEI of over $65 per hour of user benefits. MOS 2 would be less cost-effective than Alternatives 1 through 3.

7.5.2 Equity

Compared with the longer rail alternatives, MOS 1 serves a part of the study area that has a larger percentage of residents who are low income or minority, as shown in Table 7-6.

Table 7-6. Evaluation Results for Project Phasing Options

	No Build	TSM	MOS 1	MOS 2	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Cost Effectiveness									
Capital cost in million 2009 dollars	Base	$42	$1,852	$3,263	$4,036	$4,358	$6,116	$6,985	$8,747
Annual O&M cost in million 2009 dollars	$1,742	$1,746	$1,767	$1,764	$1,778	$1,782	$1,804	$1,831	$1,861
Cost per hour of user benefits compared with TSM	NA	Base	$65.55	$37.43	$35.98	$33.58	$36.31	$49.50	$47.55
Equity									
Low income residents within 1/2 mile of guideway alignment	NA	NA	17,254	21,382	25,707	27,180	32,114	38,799	43,733
% of residents who are low income	NA	NA	20.1%	16.6%	17.3%	17.1%	15.6%	16.4%	15.4%
Minority residents within 1/2 mile of guideway alignment	NA	NA	58,936	64,954	71,939	74,236	83,491	93,688	102,943
% of residents who are minority	NA	NA	68.3%	50.3%	47.0%	45.5%	39.5%	38.9%	35.6%